Section 2
Water Demands

Demand for water in the Water Authority's service area falls into two classes of service: municipal and industrial (M&I), and agricultural demand. M&I uses currently constitute about 80 to 85 percent of regional water consumption. The remaining 15 to 20 percent of demand has historically been attributable to agricultural water use, primarily for irrigation of nurseries, groves, and crops. This section describes these use categories along with the total historic, current, and projected water demands. By 2035, total normal water demands are projected to reach 785,685 AF (including future conservation, demand associated with projected near-term annexations, and accelerated forecasted growth), which represents a 20 percent increase from the average 648,030 AF of demand that occurred over the period 2005-2010.

2.1 Municipal and Industrial Water Demand

Total retail M&I demand encompasses a wide range of water uses that include residential demand (water used for human consumption in the home, domestic purposes, and outdoor residential landscaping) and water used for commercial, industrial, and institutional purposes.

2.1.1 Residential Demand

Residential water consumption covers both indoor and outdoor uses. Indoor water uses include sanitation, bathing, laundry, cooking, and drinking. Most outdoor water use entails landscaping irrigation requirements. Other minor outdoor uses include car washing, surface cleaning, and similar activities. For single-family homes and rural areas, outdoor demands may constitute up to 60 percent of total residential use.

The estimated composition of San Diego's 2010 regional housing stock was approximately 60 percent single-family homes, 36 percent multi-family homes, and 4 percent mobile homes. Single-family residences generally contain larger landscaped areas, predominantly planted in turf, and require more water for outdoor application in comparison to other types of housing. The general characteristics of multi-family and mobile homes limit outdoor landscaping and water use, although some condominium and apartment developments do contain green belt areas.

2.1.2 Commercial and Industrial Demand

Commercial water demands generally consist of uses that are necessary for the operation of a business or institution, such as drinking, sanitation, and landscape irrigation. Major commercial water users include service industries, such as restaurants, car washes, laundries, hotels, and golf courses. Economic statistics developed by the San Diego Regional Chamber of Commerce indicate that almost half of San Diego's residents are employed in commercial (trade and service) industries.

Industrial water consumption consists of a wide range of uses, including product processing and small-scale equipment cooling, sanitation, and air conditioning. Water-intensive industrial uses in the city of San Diego, such as electronics manufacturing and aerospace manufacturing, typically require smaller amounts of water when compared to other water-intensive industries found

elsewhere in Southern California, such as petroleum refineries, smelters, chemical processors, and canneries.

The tourism industry in San Diego County affects water usage within the Water Authority's service area not only by the number of visitors, but also through expansion of service industries and attractions, which tend to be larger outdoor water users. Tourism is primarily concentrated in the summer months and affects seasonal demands and peaking. SANDAG regional population forecasts do not specifically account for tourism, but tourism is reflected in the economic forecasts and affects per capita water use.

2.2 Agricultural Water Demand

The moderate and virtually frost-free coastal and inland valley areas of the county are able to support a wide variety of subtropical crops, making the San Diego region a unique agricultural region. The introduction of relatively low-cost water supplies in the 1950's allowed significant growth to occur in this sector. Agricultural water use within the Water Authority's service area is concentrated mainly in the north county, and includes member agencies such as the Rainbow, Valley Center, Ramona, and Yuima Municipal Water Districts, the Fallbrook Public Utility District, and the city of Escondido. The primary crops grown for local, national, and international markets are avocados, citrus, cut flowers, and nursery products. Local fresh market crops and livestock are raised to a lesser extent in the Water Authority's service area.

In recent years, agriculture demand has dropped significantly due to mandatory supply allocations that resulted from drought conditions and judicial restrictions on State Water Project supply availability. Starting in calendar year 2008, member agency customers that were voluntarily receiving discounted agricultural water, were required to implement a 30 percent cutback in agricultural demand from their fiscal year 2007 baseline. To comply with the mandatory cutback, growers implemented various actions that included tree stumping and plant stock reduction. As a result, agricultural demand dropped from 98,262 AF in fiscal year 2007 to 43,515 AF in fiscal year 2010, a 55 percent decline in program agricultural demand.

2.3 Total Current and Historic Water Use

Water use in the San Diego region is closely linked to the local economy, population, and weather. Over the last several decades a prosperous economy had stimulated local development and population growth, which in turn produced a relatively steady increase in water demand. However, by the late-2000s, the combination of economic recession, Metropolitan supply allocations, implementation of member agency mandatory water use restrictions, and mild local weather culminated in a dramatic multi-year decrease in total water demand. In fiscal year 2007, water demand in the Water Authority's service area reached a record level of 741,893 AF, only to drop roughly 24 percent to 566,443 AF by fiscal year 2010. The 175,450 AF reduction in demand represents the largest volumetric decline over a three-year period in the Water Authority's history. This drop is attributable to a combination of factors, including mandatory water use restrictions, a growing conservation ethic, greater consumer price response to the retail cost of water, the national recession and high rate of home foreclosures. This period also included slightly cooler temperatures and more normal rainfall amounts. Table 2-1 shows the historic water demand within the Water Authority's service area.

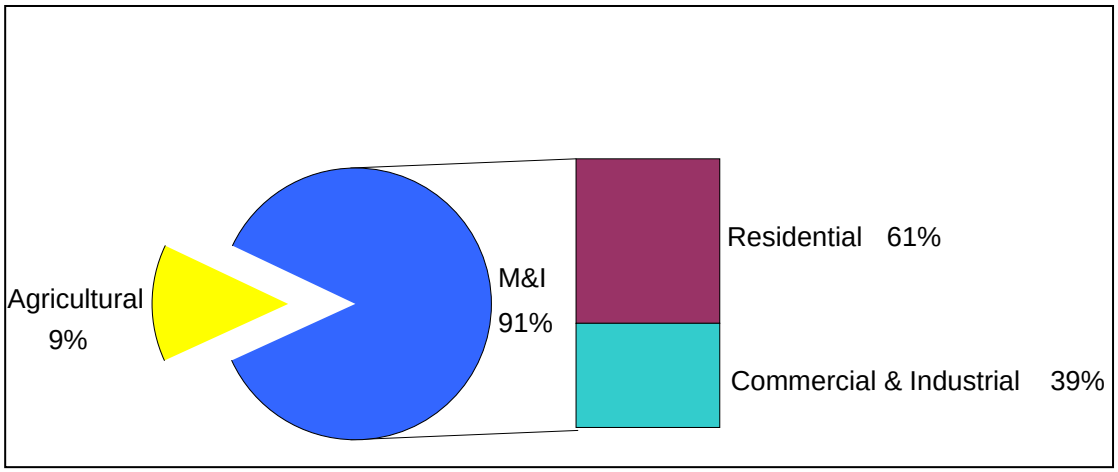
Table 2-1. Historic Water Demand within Water Authority Service Area (1995–2010)

Fiscal Year	Water Use (AF)
1995	526,053
1996	615,900
1997	621,739
1998	562,225
1999	619,409
2000	694,995
2001	646,387
2002	686,530
2003	649,622
2004	715,763
2005	642,152
2006	687,253
2007	741,893
2008	691,931
2009	643,900
2010	566,443

Source: Water Authority Annual Reports

Figure 2-1 shows the estimated relative percentages of various categories of water demand within the Water Authority's service area for fiscal year 2010. In this figure, residential demand includes single-family residential and multi-family residential.

Figure 2-1
Estimated Type of Water Use Fiscal Year 2010



2.4 Projected Water Demands

Since the mid-1990s, the Water Authority has utilized an econometric model to develop its long-range M&I demand forecasts. This computer model is based on the U.S. Army Corps of Engineers Municipal And Industrial Needs (MAIN) model, which has over a quarter of a century of practical application and is used by many cities and water agencies throughout the United States. The Water Authority's version of the model, known as CWA-MAIN, was modified by a consultant to reflect the San Diego region's unique parameters. The CWA-MAIN model relates historic water demand patterns to variables such as household income, consumer response to the price of water, and weather, to predict future M&I water demands. These datasets are compiled from various sources, including SANDAG, Water Authority member agencies, and the Scripps Institution of Oceanography. Under the terms of a 1992 memorandum of agreement between the Water Authority and SANDAG, the Water Authority utilizes SANDAG's official forecast, which is based on local land use jurisdictions' general plans and policies, to project consumptive water demands for the region. This coordination ensures linkage between local jurisdictions' general plans and the Water Authority's projected water demands.

In February 2010, SANDAG's Board adopted the 2050 Regional Growth Forecast for planning analysis purposes, also referred to as SANDAG Series 12 forecast. Two key refinements of the 2050 Regional Growth Forecast include an economic outlook that factors in the current recession and local jurisdictions' general/specific plan updates not completed at the time of SANDAG's last forecast. Based on these updates, SANDAG population projections for the Water Authority service area are on average about one percent higher than 2005 Plan estimates. Housing unit projections are also up - with approximately 32,000 more units forecasted by 2030 compared to SANDAG's Series 10 forecast. However, this additional housing is more heavily weighted towards multi-family units in the 2050 Regional Growth Forecast. These newly released SANDAG demographic and economic projections (i.e., housing units, household density, household size, and employment counts) were incorporated into the CWA-MAIN model. It should be noted that SANDAG does not forecast land use on Marine Corps Base Camp Pendleton (MCB Camp Pendleton). Therefore, demand projections for MCB Camp Pendleton were developed outside of the CWA-MAIN model and were based on projections provided by base staff.

In the past, M&I demands were adjusted to account for conservation savings based on projected implementation of the California Urban Water Conservation Council's Best Management Practices. Under this bottom-up approach, total forecasted conservation savings was derived from the estimated number of water-conserving devices installed. However, commencing with Water Code Section 10608 in 2009 (SBX7-7) a paradigm shift in the state's demand management philosophy occurred with the adoption of Part 2.55 of Division 6 of the Water Code. This new legislative mandate requires retail agencies to meet a 20 percent reduction in their per capita potable water use by 2020. Compliance with SBX7-7 can be through a wide range of actions such as development of recycled water supplies, retail water pricing, and traditional conservation programs. For additional information regarding SBX7-7, see **Sections 2.4.2** and **3.2**.

Agricultural demand projections were developed through a cooperative effort between Water Authority staff, its member agencies, SANDAG, County of San Diego Agricultural Weights and Measures, and the California Avocado Commission. A separate forecast model, developed as part of the 2005 Plan update, was used to project member agency level agricultural demands. Forecast driver variables include irrigated acreage within the Water Authority's service area, estimated crop type distribution, and calculated historic water use factors. SANDAG's projection of agricultural land

conversions to other land use categories, provides the long-term trend in acreage used to forecast agricultural water use. The total agricultural forecast is then separated into two categories: (1) projected demands in the Water Authority's Special Agricultural Water Rate (SAWR) program and (2) demands under the Water Authority M&I rate or agricultural demands met through local supplies. It should be emphasized that the delineation between these two categories is a rough estimate based on professional judgment and takes into account the potential future acreage in the SAWR program.

2.4.1 Projected Normal Water Demands

Table 2-2 shows projected normal year total water demand for the Water Authority service area through 2035. Baseline total regional M&I demand projections reflect historic passive conservation, MCB Camp Pendleton area demands, and an increment of demand associated with the decay of historic active conservation program savings. In addition, to fully quantify potential demands served by the Water Authority, a small increment of water use associated with known future potential annexations and accelerated forecasted growth was incorporated into the demand forecast. Beginning with the 2005 Plan, an increment of demand related to potential near-term annexations was added to the baseline M&I forecast. Estimated demands for these parcels were provided to the Water Authority by the associated member agency. However, incorporation of these demands provides no assurance of annexation. Approval by the Water Authority Board is still required before water service may be provided to these lands.

To provide for a more comprehensive planning analysis, the 2010 Plan includes water use associated with accelerated forecasted residential development as part of the M&I sector demand projections. These forecasted housing units were identified by SANDAG in the course of its regional housing needs assessment, but are not yet included in local jurisdiction's existing general land use plans. The demand associated with accelerated forecasted growth is intended to account for a portion of SANDAG's residential land-use development currently projected to occur between 2035 and 2050, but has the potential to occur on an accelerated schedule. SANDAG estimates that general plan amendments, allowing this accelerated residential development, could occur within the planning horizon of the 2010 Plan update. Because these units are not yet included in local jurisdictions' general plans, their projected demands are incorporated at a regional level and not associated with specific member agencies. Additionally, these demands were developed in accordance with the 20 percent reduction in per capita water use, by the year 2020, required under SBX 7-7.

Although Water Code Section 10631.1 requires UWMP demand projections to include separate water use estimates for low income single family and multi-family residential households, this requirement does not apply to wholesale water suppliers as documented in the Department of Water Resources, Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan - Final March 2011. As such, regional water demand projections listed in Table 2-2 represent water use estimates for all income levels included in SANDAG's 2050 Regional Growth Forecast.

Table 2-2. Total Regional Baseline Demand Forecast (Excludes Future Conservation)

	2015	2020	2025	2030	2035
Baseline M&I Demand[1,2,3]	590,731	661,415	728,574	788,174	839,417
Baseline Agricultural Demand – Program	30,358	27,164	26,531	25,927	25,324
Baseline Agricultural Demand – Full Service	25,000	22,370	21,849	21,352	20,854
Near-Term Annexations[4]	5,709	6,670	6,670	6,670	6,670
Accelerated Forecasted Growth	2,224	4,421	6,605	8,776	10,948
Total Baseline Demand Forecast	654,022	722,040	790,229	850,899	903,213

[1] Includes approximately 12,000 AF of demand for Camp Pendleton – provided by base staff.

[2] Reflects passive historic conservation savings.

[3] Includes increment of demand associated with the decay of historic active conservation program savings (2015 = 7,111 AF; 2020 = 14,221 AF; post-2020 = 21,332 AF).

[4] Known near-term annexation demands include: Escondido (314AF), Otay Ranch Village 13 and parcels East of Village 13 (2,361AF), Peaceful Valley Ranch (70AF), Sycuan Reservation (392AF), Stoddard Parcel (2AF), San Ysidro Mt. Parcel Village 17 (148AF), Viejas (2,000AF), Rincon (417AF), Meadowood Development (460AF), Pauma Ranch (76AF) and Warner Ranch/Sycamore Ranch (430AF). Including the demands for these parcels does not limit the Board's discretion to deny or approve these or other annexations not contemplated at this time.

The Water Authority has implemented programs and procedures to proactively maintain its water distribution system. These efforts have resulted in annual historic system losses of up to approximately 2 percent per year. For demand forecasting purposes, Water Authority system losses were set at 1 percent of annual baseline water demands. Using these factors, the Water Authority's system losses were estimated as follows: Year 2005 (historic) – 11,100 AF, Year 2010 (historic) – 9,800 AF, Year 2015 – 6,200 AF, Year 2020 – 6,800 AF, Year 2025 – 7,400 AF, Year 2030 – 7,900 AF, and Year 2035 – 8,500 AF.

2.4.2 SBX 7-7 – Conservation Savings Projections based on Retail Agency Compliance

SBX7-7 was enacted to require retail urban water agencies within the state to achieve a 20 percent reduction in urban per capita water use by December 31, 2020, (Water Code Section 10608.20) and report progress in meeting water use targets (Water Code Section 10608.40.) The Water Authority is a wholesale agency not directly subject to these requirements. Member agencies that serve military installations shall consider requirements under Executive Order 13423 in complying with SBX7-7. However, it is critical for planning purposes that retail compliance of SBX7-7 and corresponding demand reduction be reflected in the Water Authority's 2010 Plan. To clearly reflect retail compliance, the Water Authority is utilizing the Urban Water Use Targets, as defined in Water Code Section 10608.20(a)(1), that were calculated by each of the member agencies to determine the regional demand reduction for inclusion in the 2010 Plan. The 2010 Plan also contains the assumption that because SBX7-7 does not require an agency to identify GPCD targets beyond 2020, for planning purposes, the 2025 through 2035 GPCD targets were set at agencies' 2020 GPCD targets.

The first step in evaluating compliance with SBX7-7 is to determine member agencies' water use efficiency targets. To calculate water use efficiency targets, each agency's SBX7-7 acre-foot potable

demand target is first calculated based on the GPCD targets provided by the agency and SANDAG population projections. These demand targets are then subtracted from the projected baseline demands derived from the Water Authority's CWA-MAIN model to determine the water use efficiency target that must be met in order to comply with SBX7-7. The numbers are totaled in Table 2-3 to provide a regional water use efficiency target. It should be noted that water use efficiency targets were set to zero for agencies that have already met their target, where SBX7-7 demand targets exceed their projected baseline demands. Additionally, because SBX7-7 compliance rests at the retail level, member agency demand projections exclude the increment of regional water use attributed to accelerated forecast growth. This demand increment is included in the Water Authority's regional projections for supply reliability analysis.

Table 2-3. Member Agency Water Use Efficiency Targets (AF)

	2015	2020	2025	2030	2035
Total Member Agency Baseline Demand[1]	651,798	717,619	783,624	842,123	892,265
SBX7-7 Potable Demand Target	636,412	640,914	672,861	703,531	731,064
Total Water Use Efficiency Target	-15,386	-76,705	-110,763	-138,592	-161,201

[1]Demands associated with accelerated forecasted growth were developed at a regional level; they are excluded from aggregated member agency baseline projections.

Consistent with SBX7-7 guidelines, member agency water use efficiency targets can be met through both recycled water supplies and additional conservation savings. Table 2-4 shows derivation of the net additional conservation required under SBX7-7 once member agency verifiable recycled water supplies, necessary to meet the target, are accounted for. Refer to **Section 5.4** for details on member agency water recycling projections.

Table 2-4. Member Agency Additional Water Conservation (Acre-Feet)

	2015	2020	2025	2030	2035
Total Water Use Efficiency Target	-15,386	-76,705	-110,763	-138,592	-161,201
Verifiable Recycled Water Applied to Meet Water Use Efficiency Target [1, 2]	8,649	29,754	38,529	41,312	43,673
Additional Conservation Required[3]	-6,737	-46,951	-72,234	-97,280	-117,528

[1] Excludes recycled supplies for agencies with SBX7-7 demand targets exceeding their baseline demands.

[2] Recycled supplies set equal to water use efficiency target for agencies with recycled supplies in excess of their target.

[3] Additional increment of conservation, beyond existing savings, required to meet water use efficiency target.

Table 2-5 shows the Water Authority's regional normal year water demand forecast taking into account member agency additional water conservation derived through compliance with SBX7-7.

Table 2-5. Normal Year Regional Water Demand Forecast Adjusted for Water Conservation (AF)

	2015	2020	2025	2030	2035
Total Regional Baseline Demand	654,022	722,040	790,229	850,899	903,213
Additional Conservation	-6,737	-46,951	-72,234	-97,280	-117,528
Total Baseline Demand with SBX7-7 Conservation	647,285	675,089	717,995	753,619	785,685

Figure 2-2 illustrates the forecasted trend in projected water demands over the 2015 to 2035 time period. This figure combines historic water use and forecasted normal year demands reduced by future additional conservation savings.

Figure 2-2

Regional Historic and Projected Normal Water Demands (AF)

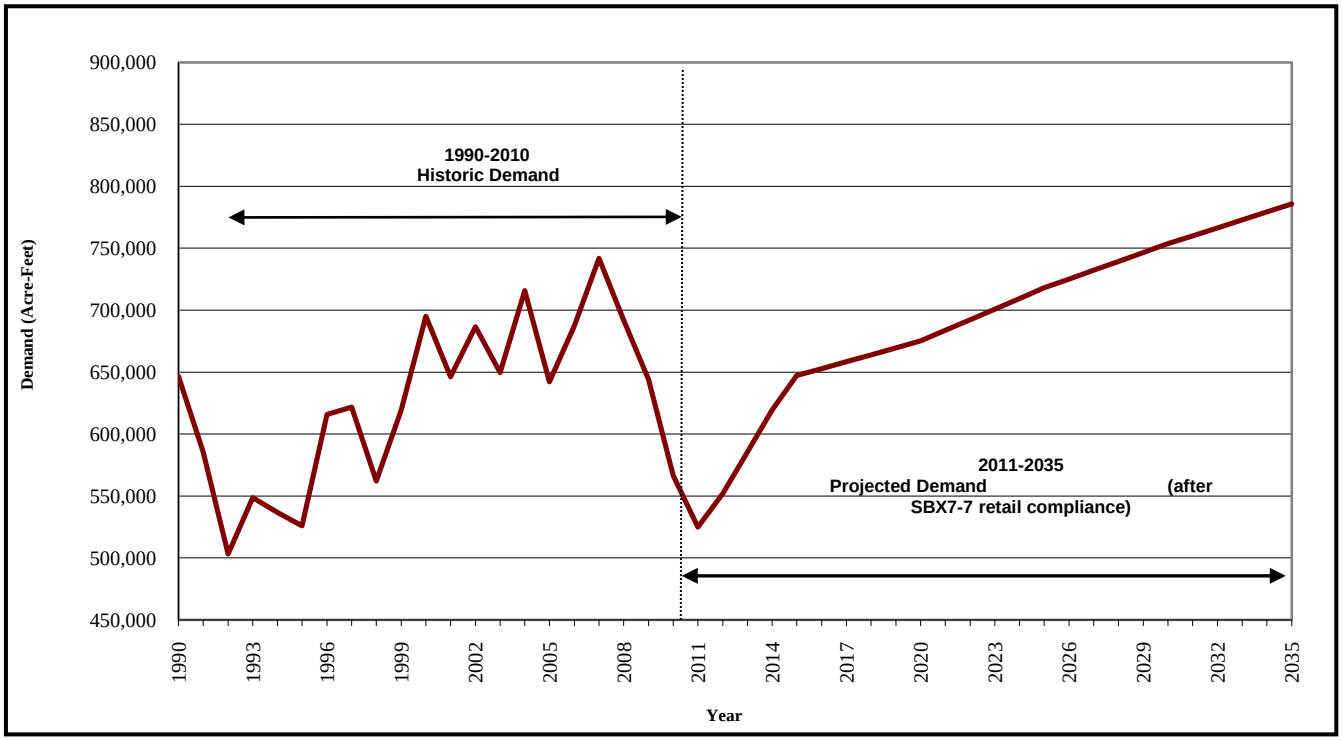


Table 2-6 shows the member agency potable SBX7-7 retail demand targets, based on retail level targets provided by the agencies, SANDAG population forecast for the member agencies and the regional estimates of SBX7-7 potable GPCD targets for each five-year increment.

Table 2-6. SBX7-7 Potable Retail Demand Targets and GPCD Targets

	2015	2020	2025	2030	2035
SBX7-7 Retail Demand Target (AF) [1]	636,412	640,914	672,861	703,531	731,064
Member Agency Population	3,271,773	3,438,837	3,599,952	3,758,933	3,906,718
Estimated Regional Member Agency Potable GPCD Target	174	167	167	167	167

[1] Demand targets based on the individual member agency GPCD target demands.

2.4.3 Projected Dry-Year Water Demands

In addition to a baseline normal demand projection, the Act also requires single dry-year and multiple dry-year demand estimates to evaluate water service reliability during dry-year events. Based on observed historic demand impacts associated with each of these events, separate approaches were taken to forecast single and multiple dry-year conditions.

To develop single dry-year projections, a demand response index formula was used to identify the historic high temperature and low rainfall weather parameters that resulted in the maximum impact. Using this index, a representative single dry-year was selected. For this forecast, the year 1989 was selected. The monthly weather patterns associated with 1989 were then substituted into the CWA-MAIN model to generate dry-year demands projections. By holding all non-weather related predictive variables constant, the model produces an annual forecast of dry-year weather-driven demand. Projected single dry-year demands are shown in Table 2-7.

Table 2-7. Single Dry-Year Regional Water Demand Forecast (AF) [Adjusted for Water Conservation]

	2015	2020	2025	2030	2035
Single Dry-Year Demand	694,257	765,409	836,967	901,210	956,544
SBX7-7 Additional Conservation Savings	-6,737	-46,951	-72,234	-97,280	-117,528
Total Demands with SBX7-7 Conservation	687,520	718,458	764,733	803,930	839,016

In accordance with the Act, agencies are also required to prepare additional dry period scenarios spanning multiple consecutive years. The major challenge in developing multiple dry-year forecasts is that persistent drier than normal weather over 24 to 36 months results in a compounding effect on rates of water use. Since the CWA-MAIN model was constructed to forecast demand for discrete 12-month periods, other statistical methods were required to develop projected water use for consecutive dry years. The modeling approach developed correlates trends in historical Water Authority deliveries with multi-year trends in observed precipitation to construct a set of consecutive dry year impact factors. In this approach, running 12-month averages of deliveries were modeled independently as a function of 24- and 36-month running averages of the ratio of observed rainfall to normal monthly precipitation. Historic mean regional weather data was then evaluated to select conditions that could be defined as the driest consecutive two- and three-year periods over the last several decades. Using the statistical model parameters and a repeat of the identified multiple dry-year weather patterns, the two and three consecutive dry-year demand projections for each five-year increment were developed. Multiple dry-year demand projections net of future conservation savings are shown in Table 2-8.

Table 2-8. Multiple Dry-Year Water Demand Forecast Including Future Conservation Savings (AF)

	2012	2013	2014
Total Estimated Demands	658,381	679,509	711,241
	2016	**2017**	**2018**
Total Estimated Demands	682,338	705,461	740,326

	2021	2022	2023
Total Estimated Demands[1]	724,294	751,800	790,177
	2026	**2027**	**2028**
Total Estimated Demands	772,892	801,649	844,137
	2031	**2032**	**2033**
Total Estimated Demands	811,421	842,947	882,795

[1] Drop in demand from year 2018 to 2021 is due to full retail compliance with SBX7-7.

2.4.4 Projected Climate Change Impact on Water Demands

Although not currently required by the Act, evaluation of potential climate change impacts on water demand represents a prudent water resources planning exercise. However, definitive projections on the timing and magnitude of climate change–initiated variations to local temperature and precipitation patterns are still forthcoming. The body of work currently available from national and international research contains a full spectrum of possible outcomes based on numerous GHG emission scenarios run through an assortment of General Circulation Models (GCMs). In the absence of research consensus, the Water Authority has adopted a qualitative evaluation approach that uses a manageable number of climate change scenarios to develop a range of potential demands.

The Water Authority's development of climate scenarios starts with the selection of representative GHG emission scenarios. Selection criterion focused on scenarios that represented a practical range of global socioeconomic development. Using this metric, two emission scenarios (Scenario B1 – lower emissions scenario and Scenario A2 – medium-high emissions scenario) were selected from the Intergovernmental Panel on Climate Change's (IPCC's) Special Report on Emissions Scenarios. Emission Scenario B1 represents a future with high levels of environmental consciousness combined with a global approach to more sustainable development that results in carbon dioxide (CO_2) concentrations of roughly 550 parts per million (ppm) by 2100, approximately 41 percent above current CO_2 concentrations. In contrast, Emission Scenario A2 is based on a differentiated world in which global economic growth is uneven and large income gaps remain between industrialized and non-industrialized parts of the world. Atmospheric CO_2 concentrations under this scenario more than double, from 391 ppm in 2011 to 850 ppm by 2100.

Next, an evaluation of GCMs was conducted to assess their strengths and weaknesses in continental weather modeling. Models were screened to evaluate their ability to effectively represent the El Niño and Pacific Decadal Oscillation events. The ability to replicate these climatological events indicates a level of fitness to forecast Pacific costal weather patterns that impact the Southern California climate. Based on this benchmark, the following GCMs were selected; CNRM-CM3 (Center National Weather Research, France), GFDL-CM2.1 (Geophysical Fluid Dynamics Laboratory, USA), NCAR-PCM1 (National Center for Atmospheric Research, USA).

Since current GCMs forecast climate at a coarse spatial resolution of 200–500 kilometers, fine-scale precipitation and temperature projections required for sub-regional water demand analysis are not readily available. To develop the necessary fine-scale climate scenarios, the Water Authority secured technical climate modeling assistance from Scripps Institution of Oceanography staff. Using the Constructed Analogues downscaling methodology, Scripps staff produced high resolution climate forecasts for the San Diego region. These downscaled climate estimates were constructed using linear combinations of historic weather patterns. The 30 most similar, previously observed weather

patterns were used in a linear regression analysis to obtain precipitation and temperature estimates that best match the coarse resolution GCM patterns. The coarse-scale meteorological observations and their corresponding high resolution local historic patterns were then used to construct a climate modeling library. Using this library, a set of fine-scale (roughly 13-kilometer resolution) precipitation and temperature forecasts for 2035, 2050, and 2099 were developed for the ensemble of six climate scenarios (2 GHG x 3 GCMs).

Evaluation of the downscaled climate change scenarios indicated no dramatic shifts in seasonal patterns of precipitation for the San Diego area under either emission scenario. Additionally for reference year 2035, the end of the 2010 Plan planning horizon, mixed results were observed in the variation of precipitation projections among the climate models. Three of the climate projections resulted in annual precipitation estimates lower than the historic average. Similarly, temperature modeling revealed no dramatic shifts in seasonal patterns, and mixed results prevailed between projected temperatures and historic averages for reference year 2035. The disagreement in short-term climate projections is not entirely unexpected given the protracted lead-time forecasted for significant build up of greenhouse gases. Over an extended timescale, the ensemble of climate scenarios converge on the direction of temperature impact – with five of the six climate scenarios indicating warmer annual average temperature conditions for 2050 and 2099.

The range of climate change impacts on Water Authority demands was calculated by substituting the six climate scenarios into the CWA-MAIN model. For reference year 2035, all but one of the climate scenarios resulted in total water use slightly higher than baseline normal weather demands. The average climate change impact on 2035 demand, across all three GCMs, ranged from 0.63 percent increase under Emission Scenario B1 to 1.8 percent increase for Emission Scenario A2. The relatively small increase in 2035 demand under all climate scenarios suggests that significant water demand impacts associated with the forecasted trend toward warmer and drier climate conditions may occur on a time-step beyond the 2010 Plan planning horizon.

2.4.5 Member Agency Demand on the Water Authority

Table 2-9 shows the Water Authority's projected water demands (sales) by member agency. Water demands were calculated using SBX7-7 compliant baseline demands for each member agency, as forecasted in Section 2.4.2, minus verifiable local supply projections. Therefore, the projected imported demands (sales) are directly tied to the success of local supply development in **Section 5**, "Member Agency Supplies," and compliance with SBX7-7 conservation savings requirements discussed in **Section 3.2**.

Table 2-9. Member Agency Normal Year Imported Demand on the Water Authority [1,2,3,4] (AF)

Member Agency	2005	2010	2015	2020	2025	2030	2035
Carlsbad MWD	21,132	16,170	16,862	18,600	20,612	22,273	23,253
Del Mar, city of	1,297	1,075	1,222	1,224	1,236	1,251	1,266
Escondido, city of	21,446	14,388	23,734	21,337	22,913	23,931	24,601
Fallbrook PUD	17,333	11,593	14,140	15,047	16,338	17,528	18,318
Helix WD	28,754	25,780	33,441	32,126	33,754	35,823	37,898
Lakeside WD[5]	N/A	3,129	4,114	4,424	4,600	4,734	5,045
Oceanside, city of	31,307	21,765	23,566	24,094	25,097	26,294	26,702

Member Agency	2005	2010	2015	2020	2025	2030	2035
Olivenhain MWD	22,429	18,461	21,118	21,552	21,874	22,539	22,854
Otay WD	40,100	29,387	40,483	41,244	43,934	45,889	48,524
Padre Dam MWD[5]	19,945	11,578	14,935	15,913	17,105	17,740	18,656
Pendleton, MCB Camp	846	844	850	850	850	850	850
Poway, city of	14,209	10,266	12,593	13,020	13,422	13,954	14,076
Rainbow MWD	28,911	18,322	21,537	21,070	22,446	24,078	26,137
Ramona MWD	10,257	6,047	11,213	10,635	11,455	12,159	12,539
Rincon del Diablo MWD	7,952	5,750	3,696	5,429	6,024	6,765	7,024
San Diego, city of	184,335	181,691	201,721	221,458	237,622	249,728	260,107
San Dieguito WD	6,113	1,635	4,736	5,025	5,453	5,677	5,836
Santa Fe ID	11,158	4,374	8,738	8,093	8,426	8,704	8,919
Sweetwater Authority	12,109	6,985	8,125	3,292	3,671	4,461	5,292
Vallecitos WD	19,428	15,419	18,666	17,454	18,777	19,547	19,949
Valley Center MWD	42,265	25,619	32,497	32,526	34,459	36,403	38,537
Vista ID	18,367	11,225	16,080	15,961	16,954	17,825	20,000
Yuima MWD	3,103	1,847	2,098	2,006	2,267	2,510	2,707
Sub-Total	**562,795**	**431,770**	**536,165**	**552,380**	**589,289**	**620,663**	**649,090**
Accelerated Forecast Growth [6]	--	--	2,224	4,421	6,605	8,776	10,948
Total	**562,795**	**431,770**	**538,389**	**556,801**	**595,894**	**629,439**	**660,038**

[1] Based on SANDAG 2050 Regional Growth Forecast

[2] Includes historic and projected water conservation

[3] Includes demands associated with member agency known near-term annexations

[4] Assumes member agency implementation of verifiable local supply projections

[5] Lakeside WD detached from Padre Dam MWD in 2006

[6] Demands associated with accelerated forecasted growth are not attributed to individual member agencies and to individual member agencies and are listed for regional planning purposes

Definitions:

ID = Irrigation District; MWD = Municipal Water District; PUD = Public Utility District; WD = Water District